

Appln No. 09/989,367
Amdt date August 9, 2005
Reply to Office action of May 9, 2005

Amendments to the Drawings:

The attached sheets of drawings include changes to Figs. 1, 13 and 14A. These sheets, which include Figs. 1, 13 and 14A, replace the original sheets including Figs. 1, 13 and 14A.

Attachment: Replacement Sheets

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REMARKS/ARGUMENTS

In the Office action dated May 9, 2005, the Examiner raised objections to the drawings, the specification and the claims. In addition, claims 1 - 50 were rejected under 35 U.S.C. § 102 or 35 U.S.C. § 103.

By this Amendment, Applicant has amended claims 7, 10, 23 and 30 and canceled claims 47 and 48. In addition, Applicant has amended the Specification and the drawings. Reconsideration and reexamination are hereby requested for claims 1 - 46 and 49 - 50 that are now pending in this application.

Response to the Objection to the Drawings

The Examiner objected to the drawings based on the duplicative use of the reference numeral "1307." Applicant has amended the specification and Figures 13 and 14A to designate "decisions" by reference numeral 1319 instead of reference numeral 1307. In Figure 13 the reference numeral 1319 has been added and associated with the "decisions" signal. In Figure 14A the reference numeral "1307" previously associated with the "decisions" signal been changed to reference numeral "1319."

The Examiner objected to the drawings based on the failure to show reference numerals "101" and "1427" that are mentioned in the specification. Applicant has added the reference numeral "101" to Figure 1. Applicant has added the reference numeral "1427" to Figure 14A. Applicant submits that no new matter has been added because this amendment is supported, for example, by the original context of the specification at page 6, lines 21 - 29 and page 22, lines 30 - 34 and Figures 1 and 14A.

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The Examiner requested that Figures 1 - 12 be designated as prior art. Applicant respectfully traverses this objection. Several of these figures are used to illustrate how various aspects of some of the embodiments may be implemented. Several of the figures show results that may be achieved by an embodiment. Several of these figures illustrate how design choices may be made when implementing various embodiments. While some of the equipment and materials shown in the figures were readily available, read in the context of the entire disclosure, the figures do not constitute prior art.

See, for example, the following citations to the Specification that illustrate some examples of these relationships and some examples of relationships between the figures. Page 6, lines 20 - 21 ("Accordingly, Figure 1 is a graphic illustration of an environment in which embodiments of the present invention may be used."); page 12, lines 21 - 24 ("In the present embodiment the measurements are stored in a file and then processed off-line in a computer using a software program that implements the remainder of the system illustrated in Figure 4."); page 12, lines 17 - 18 ("What is used for the channel 403 is the measurements that were taken with the setup illustrated in Figure 2."); page 8, lines 28 - 29 ("Figure 3 is a table listing of fibers, which were measured using the measurement setup illustrated in figure 2."); page 15, lines 8 - 9 ("In the present embodiment out of the 16 Volterra Kernels only the four illustrated in Fig. 5 are significant, the others are negligible."); page 16, line 23 through page 19, line 10 which illustrate through Figures 6 - 8 and 9 - 12 an example of

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how different systems (e.g., 850 nanometer and 1310 nanometer) may utilize different Kernels.

The Examiner also objected to the drawings "because in figure 14A there are lines that have not been printed inside of block 1401." Applicant has amended Figure 14A to add the missing lines that connect to the arrows on the bottoms of FIR 513 and FIR 515. Applicant has assumed that the Examiner is not objecting to the broken lines in the figure that, pursuant to conventional practice, are used to show that intersecting lines are not connected to one another. Applicant has made this assumption based on the absence of a rejection to the use of this technique in Figure 14B.

Response to the Objection to the Specification

The Examiner objected to the Abstract as being longer than 150 words. Applicant has amended the Abstract accordingly. In conjunction with this amendment, Applicant has added the deleted passages to the Summary. A replacement Abstract is provided in the Appendix.

The Examiner objected to the specification because of a reference to Appendix A. Applicant has amended the specification to delete this reference.

Applicant also has amended the specification to correct several typographical errors.

Response to the Objection to the Claims

The Examiner objected to claim 6 because of a lack of antecedent basis for the term "converting the look up table" in

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claim 7. Applicant has amended claim 7 as suggested by the Examiner.

Applicant also has amended claim 10 to correct a typographical error.

Response to the § 112 Rejections of Claims 47 and 48.

Applicant has canceled claims 47 and 48.

Response to the § 102 Rejections of Claim 1 - 22

The Examiner rejected claims 1 - 22 under 35 U.S.C. § 102(b) as being anticipated by the article by Sands. Claims 1 and 11 are independent.

Applicant respectfully traverses this rejection because Sands does not disclose "sampling the data after it has passed through the channel to produce a sampled value" as set forth in claims 1 and 11. Sands only discusses digital operations, not sampling of data. The input x_k in Figure 1 is a digital signal since is designated by the subscript "k" rather than being designated as $x(t)$. See also the Abstract which states that the method relates to processing a "digital magnetic recording channel".

In view of the above, Applicant submits that independent claims 1 and 11 are not anticipated by Sands since Sands does not disclose every limitation set forth in the claims. Claims 2 - 10 and 12 - 22 that depend on claims 1 and 11, respectively, also are patentable over Sands for the reasons set forth above. In addition, these dependent claims are patentable over Sands for the additional limitations that these claims contain.

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Response to the § 103 Rejections of Claim 23 - 50

The Examiner rejected claims 23 - 50 under 35 U.S.C. § 103(a) as being unpatentable over Sakaguchi et al., U.S. Patent No. 4,747,094 (hereafter referred to as "Sakaguchi"), in view of an article by Bellini et al. (hereafter referred to as "Bellini"). Claims 23, 30, 37, 40, 43 and 46 are independent.

Claims 23 - 36

The rejection of claim 23 is based, in part, on the argument that Bellini discloses "summing the electrical signal with a correction signal; providing the summed signal to a detector; detecting the summed signal to produce decisions; providing the decisions to a nonlinear channel estimator; and estimating the correction signal in the nonlinear channel estimator." The rejection of claim 30 is based, in part, on the argument that Bellini discloses "a summation unit that sums the electrical signal with a correction signal; a detector that detects the summed signal to produce decisions; and a nonlinear channel estimator that estimates the correction signal." Here, the Examiner cites Figure 2 in Bellini and the associated discussion as disclosing the detector that outputs the decisions.

Figures 2 and 3 of Bellini are directed to two different circuits. Figure 2 is a NMLSE circuit that generates an output \hat{a}_n . Figure 3 is a cross talk canceller that may incorporate an NMLSE in its final stage to generate an output \hat{a}_{un} . In Figure 2, the output \hat{a}_n of the detector is not used to adapt any estimating

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of the non-linear Volterra Cancellor. Similarly, in Figure 3, the output \hat{a}_{un} of the NMLSE is not used to adapt any estimating of the NMLSE.

In contrast, claim 23 now recites in part: "adapting the estimating in the nonlinear channel estimator in accordance with the decisions." In addition, claim 30 now recites in part: "a nonlinear channel estimator . . . adapts the estimating in accordance with the decisions." Accordingly, Applicant respectfully submits that independent claims 23 and 30 are not obvious in view of the cited references.

Claims 24 - 29 and 31 - 36 that depend on claims 23 and 30, respectively, also are patentable over the cited references for the reasons set forth above. In addition, these dependent claims are patentable over these references for the additional limitations that these claims contain. For example, claim 24 recites in part: "predicting the inter-symbol interference of the channel in a nonlinear channel estimator." In contrast, in Figure 3 of Bellini a "third adaptive filter with M taps subtracts an estimate of the ISI on the central track." See the third full paragraph in the second column of page 935. Claim 28 recites in part: "providing the data decisions as an address into a look up table" and "outputting a value stored in the look up table as the predicted inter-symbol interference." Bellini makes no mention of a look-up table that outputs the predicted inter-symbol interference.

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Claims 37 - 42

The rejection of claim 37 is based, in part, on the argument that Bellini discloses "estimating, in a non linear channel estimator, the expected values," "computing the branch metrics based on the expected values of the received signal" and "providing the computed branch metrics to a Viterbi decoder." The rejection of claim 40 is based, in part, on the argument that Bellini discloses "a non linear channel estimator that computes the expected values of the received signal" and "a branch metrics computer for computing the branch metrics based on the expected values of the received signal" and "a Viterbi decoder that accepts the computed branch metrics."

However, in Bellini the samples h_n provided to the Viterbi Decoder in Figure 2 that are used to compute the branch metrics "are affected almost only by linear distortion." See the third full paragraph in the first column of page 935. Hence, Bellini does not teach or suggest "estimating, in a non linear channel estimator, the expected values" and "computing the branch metrics based on the expected values of the received signal" as claimed in claim 37 or "a non linear channel estimator that computes the expected values of the received signal" and "a branch metrics computer for computing the branch metrics based on the expected values of the received signal" as claimed in claim 40. In view of the above, Applicant respectfully submits that independent claims 37 and 40 are not obvious in view of the cited references.

Claims 38 - 39 and 41 - 42 that depend on claims 37 and 40, respectively, also are patentable over the cited references for

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the reasons set forth above. In addition, these dependent claims are patentable over these references for the additional limitations that these claims contain. For example, claim 39 recites in part: "providing the value of the received signal as an address to a look up table" and "looking up the stored value as the actual value transmitted." Bellini makes no mention of a look-up table used for "looking up the stored value as the actual value transmitted."

Claims 43 - 50

The rejection of claim 43 is based, in part, on the argument that Sakaguchi discloses "converting the electrical signal to a multibit digital representation." The rejection of claim 46 is based, in part, on the argument that Sakaguchi discloses "an analog to digital converter that converts the electrical signal to a multibit digital representation." However, there is no indication in Sakaguchi that it converts the received signal to a digital signal. Sakaguchi only states at column 4 that the signals are "re-timed at decision circuit DEC to make regenerated pulses." Sakaguchi does not state that this involves generating multibit digital representation. Moreover, the components downstream from the DEC in Figures 1 and 2 suggest that the output of the DEC is analog. For example, the output of the DEC is provided to a switch SW1 (which suggests an analog device) as opposed to a multiplexer that would be used for a digital signal. The output signal also is provided to a gate G1 (which suggests an analog device) as opposed to a flop-flop that would be used for a digital signal.

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Also, the specification discusses at column 6, lines 15 - 18 "filtering the DC component of the output of the circuit." This operation indicates that the circuit outputs analog signals, not digital signals. In view of the above, Applicant respectfully submits that independent claims 43 and 46 are not obvious in view of the cited references since the combination of these reference does not teach or suggest all of the limitations of the claims.

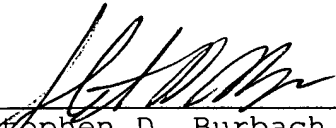
Claims 44 - 45 and 49 - 50 that depend on claims 43 and 46, respectively, also are patentable over the cited references for the reasons set forth above. In addition, these dependent claims are patentable over these references for the additional limitations that these claims contain.

CONCLUSION

For the foregoing reasons Applicant submits that the claims are patentable over the references of record. Reexamination and reconsideration are respectfully requested.

Respectfully submitted,
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